



**Approved by the NextGen Advisory  
Committee June 2016**

**Joint Analysis Team:  
Performance Assessment  
of Wake ReCat**

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*Report of the NextGen Advisory Committee in Response  
to Tasking from the Federal Aviation Administration*

*June 2016*

# Joint Analysis Team: Performance Assessment of Wake ReCat

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## Introduction/Background

The NextGen Advisory Committee (NAC) has been instrumental in helping the Federal Aviation Administration (FAA) move forward with NextGen implementation. In 2014, the Committee approved a recommendation for a set of integrated plans on four focus areas of NextGen capabilities (DataComm, Multiple Runway Operations, PBN, and Surface).

These plans were developed by a joint FAA-Industry team, the NextGen Integration Working Group (NIWG), operating under the NAC. The goal of the NIWG is to identify implementation priorities that deliver measurable benefits by certain dates, and, thereby, increase the community's confidence in NextGen.

In June 2015, the NAC considered and approved six high level performance metrics intended to measure performance impacts attributable to the deployment of the four key NIWG capabilities outlined in the "NextGen Priorities Joint Implementation Plan" of October 2014. The set of metrics are intended for the FAA and industry to collaboratively monitor performance to understand the impact of implementations. The six metrics (detailed in Appendix B) are:

- |  |   |                        |
|--|---|------------------------|
| 1. Actual Block Time                             | } | Measured by city pairs |
| 2. Actual Distance Flown                         |   |                        |
| 3. Estimated Fuel Burn                           |   |                        |
| 4. Throughput – Facility Reported Capacity Rates | } | Measured at airports   |
| 5. Taxi-Out Time                                 |   |                        |
| 6. Gate Departure Delay                          |   |                        |

Subsequently, the NAC formed the Joint Analysis Team (JAT) which includes operational and analytical experts from the FAA and industry. The JAT was formed to reach a common statement of fact regarding performance impacts and benefits that can be attributed to implementation of NextGen capabilities. To accomplish this goal, the JAT has analyzed data, metrics, methods and tools typically used by each of the parties in this type of assessment. This has included analyses of other measures deemed appropriate beyond the six metrics noted above. Additionally, the industry, through RTCA, selected PASSUR Aerospace to provide a database and associated analytical capability to track performance of these six metrics.

The JAT's scope involves evaluation of the following capabilities at the following locations:

- Wake ReCat Implementations at Charlotte Douglass International Airport (CLT) and two Chicago area airports – O'Hare International Airport (ORD) and Chicago Midway International Airport (MDW)
- Performance Based Navigation (PBN) Metroplex Implementation in North Texas
- PBN Established on RNP (EoR) in Denver International Airport (DEN)

This report includes findings on Wake ReCat implementations. Findings on the two PBN-related implementations are planned for October 2016.

## Methodology

The JAT is comprised of data and analysis experts from the FAA as well as the aviation industry, and the team conducted a series of meetings to discuss and review ongoing analysis. This team initially agreed by consensus on a methodology to evaluate the impacts of ReCat. A subset of team members then utilized their own company data to assess ReCat using this methodology. Comparisons were conducted between the raw data from the FAA, American Airlines, United Airlines and eventually PASSUR. After validating the consistency of these data sources, team members utilized the agreed-upon methodology to analyze the impacts and benefits of ReCat. Again, comparisons were done between the FAA, airline and PASSUR to ensure consistency of results. Finally, the JAT utilized these analysis results to document agreed upon findings that follow in this report.

The working dynamic between the FAA and industry team members was a positive and professional one in which capable analysts from different perspectives challenged one another's perspectives. The final product of this body is the result of strong collaboration and sharing of data and ideas between the FAA and industry. The JAT built trust and confidence amongst members throughout the process.

## Summary of Findings

- Fleet mix and overall demand levels are critical drivers of ReCat impact. Busy airports with a higher presence of Heavy/C, B757/D and Small/F aircraft are expected to see the greatest impacts.
- Operational data demonstrates that ReCat achieves changes in separation when expected.
- Before and after analysis of airborne/taxi times and throughput are inconclusive due to exogenous factors, such as changes in demand, weather, airport construction, etc.
- Airborne or taxi out savings can be expected when ReCat impacted flights operate to an individual runway that is experiencing pressure. As long as pressure remains, savings accrue for all subsequent aircraft.
- Throughput improvement can be expected when ReCat-impacted flights operate in peak demand. Modeled throughput based on actual separation changes indicates improvement. Throughput improvements are empirically observed at ORD for IMC peak periods when ReCat pairs exist, but these are not sustained enough to justify an increase in called rate.
- The PASSUR data has been compared to FAA and industry data, and can be used as a trusted data source to evaluate the impact of Wake ReCat implementations.
- JAT's ReCat methodology may be leveraged to prioritize future implementations of ReCat.

## Summary of Data Analysis Results

The JAT conducted ReCat analysis for three airport sites: CLT, ORD and MDW. Results are summarized in the table below. A full set of analysis details may be found in Appendix C.

Implications of Wake ReCat		Airports		
		CLT	ORD	MDW
Percent of eligible pairs <sup>1</sup> of flights at the airport potentially impacted by ReCat (% with decreased separation / % with increased separation)	Arrivals	2.6% / 0.0%	4.4% / 0.0%	1.1% / 0.0%
	Departures	3.3% / 1.1%	4.7% / 0.6%	1.1% / 7.6%
Modeled Potential Change in Throughput During Peak Periods due to ReCat (Operations per hour)	Arrivals	0.5	1.8	0.1
	Departures	0.6	1.5	-0.4
Estimated total savings in Airborne and Taxi Out Time due to ReCat <sup>2</sup>	Airborne	\$180K	\$590K	-\$2K
	Taxi Out	\$57K	\$360K	-\$32K
	<b>Total</b>	<b>\$237K</b>	<b>\$950K</b>	<b>-\$34K</b>

<sup>1</sup> Eligible pairs of flights are sequential flights on the same runway that are the same type of operation (both arrival or both departure), are within 5 minutes of each other and operate during the study's reporting hours (0600-2200 Local for ORD, 0700-2100 Local for MDW and 0700-2300 Local for CLT). For ORD, approximately 92% of flights are captured in eligible pairs, 47% of flights at MDW are captured in eligible pairs, and 76% of flights at CLT are captured in eligible pairs.

<sup>2</sup> Due to the significant year-over-year change in O'Hare during the JAT's study time period (new runway, United and American banking schedules, etc.), year-over-year taxi analysis was deemed to be meaningless. Instead, the JAT used queueing models to estimate impacts on taxi time.

## Appendix A: Members of the Joint Analysis Team

Mike Cirillo	Airlines for America
John Heimlich	Airlines for America
Chris Oswald	Airports Council International (ACI North America)
Balaji Nagarajan	American Airlines, Inc.
<b>Ilhan Ince (Chair)</b>	American Airlines, Inc.
Stephen Smothers	Cessna Aircraft Company
Eugene Maina	Dallas/Fort Worth International Airport
Steve Tobey	Dallas/Fort Worth International Airport
Barrett Nichols	Delta Air Lines, Inc.
Patrick Burns	Delta Air Lines, Inc.
Almira Ramadani	Federal Aviation Administration
Brian Kravitz	Federal Aviation Administration
Dan Murphy	Federal Aviation Administration
<b>Dave Knorr (Chair)</b>	Federal Aviation Administration
LaVada Strickland	Federal Aviation Administration
Leslie Higgins	Federal Aviation Administration
Pamela Gomez	Federal Aviation Administration
Paul Eckert	Federal Aviation Administration
Bradley Ammer	FedEx Express
Kyle Smith	FedEx Express
Joe Bertapelle	JetBlue Airways
Ken Elliott	Jetcraft Avionics LLC
Lee Brown	Landrum-Brown
Mark McKelligan	National Air Traffic Controllers Association
Chris Maccarone	PASSUR Aerospace
David Brukman	PASSUR Aerospace
Andy Cebula	RTCA, Inc.
Margaret Jenny	RTCA, Inc.
Trin Mitra	RTCA, Inc.
Bill Sperandio	Southwest Airlines
Debby Pool	The MITRE Corporation
Jeff Shepley	The MITRE Corporation
Pete Kuzminski	The MITRE Corporation
Alex Burnett	United Airlines, Inc.
Glenn Morse	United Airlines, Inc.
Marc Brodbeck	United Airlines, Inc.
Kevin Swiatek	United Parcel Service

## Appendix B: NAC Performance Metrics

	<u>Metric</u>	<u>Reported Values</u>	<u>Comments</u>
Measured on applicable existing 104 city-pairs:	1. Actual Block Time	Mean and std dev or 60% percentile	<ul style="list-style-type: none"> <li>Actual time from Gate-Out time to Gate-In time for a specified period of time by city pair</li> <li>GA: IFR flight time from ramp taxi to ramp park</li> </ul>
	2. Actual Distance flown	Mean and std dev or 60% percentile	<ul style="list-style-type: none"> <li>Actual track distance between key city pairs for a specified period of time</li> <li>GA: IFR flight distance from take-off to TOC &amp; from TOD to touch down</li> </ul>
	3. Estimated Fuel burn	Mean and std dev	<ul style="list-style-type: none"> <li>Actual fuel burn for a specified period of time</li> </ul>
Measured at applicable airports	4. Throughput – facility reported capacity rates*	Mean and peak capacity rates	<ul style="list-style-type: none"> <li>Facility Airport Arrival Rates (AAR) &amp; Arrival Departure Rate (ADR) Airlines (recommend: <a href="http://www.fly.faa.gov/ois">http://www.fly.faa.gov/ois</a> however, the working group is open to alternate measurements that meet the requirements)</li> <li>GA: measured as access events – Radar vector and not SID as OUT event and Ground based nav and not GPS / WAAS-LPV as IN event</li> </ul>
	5. Taxi-out Time*	Mean and std dev or 60% percentile	<ul style="list-style-type: none"> <li>Actual time from Gate-Out to Wheels-Off time by airport (minutes/flight)</li> <li>GA: IFR flight taxi time from ramp taxi to take off</li> </ul>
	6. Gate Departure Delay	Delays/100 act depts. And total delay minutes	<ul style="list-style-type: none"> <li>Difference in actual Gate-Out time and scheduled Gate-Out time, Not measured for GA</li> </ul>

\* - Identified by FAA

1 GA data may not currently be collected